

Application of Scientific Communication Work on Contextual Based to Improve Creative Thinking and Science Process Skills on Biological Education Students

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Abstract: *Competence students about science process skills play an important role in the success of the process of learning science by the scientific method approach. Motivation is a mental boost that drives and directs human behavior, including motivation in learning activities to encourage someone to learn to achieve a desired goal. Contextual approach is an approach that allows students to strengthen, expand, and apply their academic knowledge and skills in various orders of life both inside and outside the campus. In addition, students are trained to be able to solve problems they encounter (Kunandar, 2007). The purpose of this study was to determine the ability to think creatively and Biology student science process skills FKIP Unpatti Ambon, which is taught using the contextual based communication scientific work in the subject of plant morphology. There are differences in the ability of creative thinking and process skills, which are taught using the contextual based communication of scientific work and conventional (informed discussion on the subject of Plant Morphology).*

Keywords: scientific work of communication, contextual, creative thinking, science process skills, plant morphology

1. Introduction

Communicating is an activity to share information, ideas, thoughts, and observations with others verbally and in writing or by using certain means including tables and graphs. In order information, ideas, thoughts, and observations that can be understood by others clearly, the necessary communication skills. The problem is, many sources of science books do not emphasize these skills. Most books only requires students to enter numbers into a table of data that already exists, enter a number into the list of entries already made constituent, and complements the points on the question at the end of the laboratory activities. This kind of experience only teaches students how to record the data closely or how to choose the appropriate term, and not how to communicate (Dryden et al, 2000).

Students will learn communication skills by designing a table of data, compile charts and compose sentences that communicate the results of their observations. This will give you an idea of thinking creative students. Therefore Nurseto (2011) describes the communication skills including high-level thinking skills. Need a lot of experience to the development of these high-level thinking skills. In this study, to be presented experiments and strategies to teach tabulating the data and making line graphs and bar graphs by students.

The new paradigm of education stresses the learners as active and creative human beings who have the potential to constantly learn and grow with the times. Teachers no longer serve as the ultimate authority in a lesson but as a facilitator and motivator who guide the students to be more active in learning. Given this paradigm, students are expected to be more creative in finding solutions to problems faced in everyday life. Creativity is the ability to produce something new or new ideas in the face of a problem. Aware of the

importance of creativity in solving the problems of everyday life, teachers are expected to devise a method of learning and approaches to develop the creativity of students, but before that the teacher must first determine the extent of the creativity of the students by asking students to not only focus on one settlement but also some way of solving a greater emphasis on the creativity of the students.

Santayasa, (2007 describes one very important way to train students to be skilled to communicate is through the assignment of writing a journal Science. Lecturers can assign students / students to communicate about the recording of information / data observations, how they think about a topic, how far they knowledgeable about a topic, in the scientific journal, journal of science can also be filled with an overview of the information, a map of the mind, a framework or diagram and the results of their reflections about learning that day.

So far the teaching and learning activities in the classroom is still dominated by the view that knowledge as the facts to be memorized. Class continues to focus on the teacher as the main source of knowledge, and then lectures the main choice of learning strategies. For that, we need a new strategy 'learning 'more empowering students. A learning strategy that does not require students to memorize facts, but a strategy that encourages students to construct knowledge in the minds of their own. Through the foundation philosophy of constructivism, CTL 'promoted 'into a new alternative learning strategies. Through CTL strategies, students are expected to learn through 'experience ', not a set of not memorizing' (Ekowati, 2004).

Real conditions encountered in the field, among others, 1). The student experience in learning, in this case the lecturer is not optimally provide an opportunity for students to explore and discover their own concept or material that will

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be taught (There is no learning experience); 2) a large enough number of students not in accordance with the capacity of the room making it difficult for lecturers in the assessment. Students are expected to be involved in the assessment, and 3). Required creativity lecturer in lectures. This involves teaching skills of lecturers thus more pleasant climate lecture.

Biology learning activity is a product, process, and technology attitudes. Learning Biology should be implemented in an integrated manner in order to foster the ability to think in accordance with the scientific method. Competence skills are one of the achievements of graduate competence that must be possessed by students at the primary level, secondary and tertiary. *Permendikbud* No. 73 of 2013 explains that the standard of skill competencies that must be achieved by graduates of higher education degree program refers to the level of Indonesian National Qualifications Framework (KKNI) is that students are able to apply the expertise and utilize science and technology in solving problems. Additionally, *Permendikbud* No. 64 of 2013 and No. 49 of 2014 concerning the standard of education in elementary education units, secondary, and higher explained that the learning process should be able to develop the competence of attitudes, knowledge, and skills.

Scientific Work communicate applied contextually based expected more involved students or promoting student activities resulting in social skills in learning activities. With the increased activity of these students, it is expected that social skills and achievement of competence and mastery learning students also increased. Their behavior harmoniously in a learning situation between educators and learners with awareness and freedom targeted could motivate students to work scientifically actively communicate both physically and mentally through the development of their learning experience to the fullest. Students will be able to obtain information on plant morphology include matters relating to basic concepts in plant morphology, root structure, the structure of the stem, leaf structure, flower structure, the structure of the fruit and seed structures.

The sixth aspect of scientific work based contextual learning to communicate and completeness of student results as supporting data has reached the target set in the amount of 75%. The sixth aspect of scientific work to communicate among other things: 1) Communicating the qualitative characteristics and kunatitatif; 2) Communicate the summary information from the text; 3) Communicate data from a graph or table; 4) Communicate data in the form of graphs, tables and descriptions; 5) Communicate the results of observation; 6) Communicate data merging group results (Conthron, et al, 1993). This research aims to determine the effect of the application of scientific work based contextual communication applied to the ability to think creatively and science process skills of students

2. Research Methods

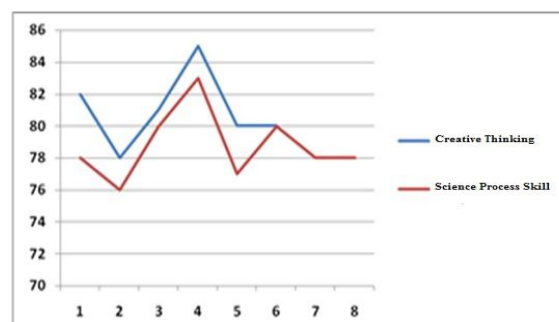
The method used in this research is the experimental method. As for the nature of this research is research quasi-experimental or quasi-experimental design (quasi-

experiment). This experimental study design using posttest only control group design. Because this research using a design using post test only control group design. Test conducted equivalence classes using ANOVA one path, Using the value end of the semester the course Morphology of plants. The variables in this study consisted of two dependent variable and one independent variable. population in this study were all students of Biology Education Studies Program 2014/2015 FKIP force, which consisted of four groups with the number of students 84 people. For the study sample used four groups, the determination of sample using random sampling technique, which is a class randomized.

In this study, using experimental class scientific work Communication while for grade control using conventional learning (discussion of information). The data in this study is the learning outcomes data subjects Morphology of Plants that use the assessment results and creative thinking ability data science process skills. Before retrieving data using test instruments, first performed validity, namely content validity and empirical validity. As for the data analysis in this research using descriptive analysis and inferential analysis. For descriptive analysis, researchers will describe results of the assessment data is creative thinking and science process skills, each of which will be described in the form of tables and histogram distribution. Descriptive analysis based on the average scores ideal (M_i) and standard deviation (S_{d_i}). As for the inferential analysis using multivariate analysis of variance (MANOVA). But before analyzing the first hypothesis to test the prerequisite analysis comprising, normality test, homogeneity test between the test data and the dependent variable. From the test requirements of the analysis carried out showed that the data were normally distributed and homogeneous.

3. Results and Discussion

Implementation of the learning activities in the lecture to find out the implementation plan and Activities Learning Semester Program (RPKPS) that had been developed by researchers in the learning process. Data obtained by the implementation of learning activities using observation sheet in accordance with the purpose of research. The purpose of research which saw aspects of creative thinking and aspects of science process skills that arise during the learning process by using the communication of scientific work is presented in Figure 1 below.



Explanation:

- Creative Thinking
 - Science Process Skill
1. Smoothness 1. Formulate the problem
 2. Flexibility 2. Formulate a hypothesis

3. Authenticity 3. Designing experiments
4. Elaboration 4. investigation / trial
5. Sensitivity 5. Manage the experimental data
6. Analyze experimental data
7. Communicate
8. Drawing conclusions

Based on Figure 1. Aspects of creative thinking and science process skills mahasiswa that have high curiosity will be better when learning to use the communication of scientific work. Likewise, the lower curiosity will be better when learning to use the communication of scientific work. But the results are better if it has a high curiosity. Creative thinking abilities increase, will affect the improvement of student science process skills when diterapkam using the communication of scientific work. The ability of communicating will affect the student's creative thinking and process skills, especially in giving meaning to the process of science.

Contextually communication is done by the students to be peer tutors for other students. How to communicate undertaken by students in the form of simple observations such as images, tables, graphs or describe the results obeservasinya the understanding is clear, precise and

unambiguous. Erick (in Asrori, 2008) describes the curiosity of students can indeed be regarded as a process of the search for meaning. Because it is a search for meaning, then it contains a desire to understand, analyze, find connections and meanings, as well as building a system. In a study of students made observations of plants in the environment to maximize the curiosity of students in order to develop properly.

Also described by Carter and Lee in David et al (1989), combines aspects of creative thinking and science process skills is a strategy that needs to be drilled to students gradual and sustainable as a business establishment of a scientific attitude. Scientific attitude is not formed spontaneously or automatically in a person who studied science, but must be designed in a systematic and sustained, mainly cognitive engineering.

The results of the analysis prerequisite test on this study, it was found that the data were normally distributed and homogeneous, as data showed the normal and homogeneous then conducted a further test MANOVA. Results of the study are shown in Table 1

Table 1: Data Scientific Working Learning outcomes Communication and Information Discussion

	Scientific work communication	Discussion Information (Conventional)
	Creative Thinking	Creative Thinking
Mean	67.55	57.72
Median	73	57
DeviseStandar	15.31	17.25
Varian	151.31	205.68
Maximum	95	83
Minimum	43	27
Scale	55	59
N	84	84

Data Table 1 shows that the value of scientific work communication reaches the average value = 67.55, median = 73, standard deviation = 15.31, variant = 151.31, Spanning = 55, maximum value = 95, and the Minimum Value = 43, n = 84 while for conventional classes achieve average value = 57.72, median = 57, standard deviation = 17.25, variant = 205.68, range = 59, maximum value and minimum value = 83 = 27. As for results research is conducted for the science process skills are shown in Table 2 below

From Table 2 provides information that class science process skills of scientific work demonstrating the value of communication mean = 82.12, median = 78, standard deviation = 19.64, variant = 275.64, range = 71, maximum value and minimum value = 98 = 35, N = 84. As for the conventional classroom science process skills (discussion of information) indicates the value average = 67.36, median = 67, standard deviation = 19.03, variant = 285.74, range = 70, the minimum value = 26 and the maximum value = 97

Table 2: Data Learning Outcomes Scientific WorkCommunication and Information Discussion

	Scientific Work Communication	Information Discussion (Conventional)
	Science Process Skills	Science Process Skills
Mean	82.12	67.36
Median	78	67
Devise Standar	19.64	19.03
Varian	275.64	285.74
Maximum	97	97
Minimum	33	26
Scale	71	70
N	84	84

Based on the value of creative thinking and the value of science process skills of students, after the categorization is done using the reference benchmark for assessing a (PAP) obtained a category for the result of creative thinking with communication of scientific work students have an average value of 72.55, well categorized. Conventional learning classes (discussion of student information with the category average of 57.72 low. For science process skills after the categorization that the average student to think of scientific communication is the 82.12 high category. Skill process of science students in the class conventional learning (discussion information) after categorization, from the average value indicates the number 67.364 in the category enough.

4. Hypothesis Test Results

1) First Hypothesis Test Results

Table 3: Multivariate Test Results Test

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.997	1.186E4 ^a	2.000	78.000	.000	.997
	Wilks' Lambda	.003	1.186E4 ^a	2.000	78.000	.000	.997
	Hotelling's Trace	304.191	1.186E4 ^a	2.000	78.000	.000	.997
	Roy's Largest Root	304.191	1.186E4 ^a	2.000	78.000	.000	.997
Scientific Work Communication	Pillai's Trace	.374	6.065	6.000	158.000	.000	.187
	Wilks' Lambda	.626	6.861 ^a	6.000	156.000	.000	.209
	Hotelling's Trace	.597	7.658	6.000	154.000	.000	.230
	Roy's Largest Root	.596	15.686 ^b	3.000	79.000	.000	.373

Based on hypothesis testing is done using analysis Multivariate Analyze of Variance (MANOVA) with the help of SPSS 16.00 for windows where the test the first hypothesis in this study using multivariate analysis tests by using test of Pillai's Trace, Wilks' lambda, Hotelling's Trace, Roy's Largest Root. From the results of hypothesis testing is done the F value = 6065 with a significance level of 0.000, due to the significance level is less than 0.05, then H₀ is rejected. The discrepancies in testing hypotheses indicate that there are differences in creative thinking and science process skills of the students who take the classes using the communication of scientific work with students who attend classes with conventional learning (discussion of information). Theoretically, the implementation of scientific work based communications contextual very position the student as a center of learning (student centered), thus giving the opportunity to the improvement of learning outcomes, views understand constructivism on learning that, active involvement of students in the learning has an important role in constructing understanding in mind ,

In a contextual approach students are placed two people in a group that is a mixture of ability level, gender, and ethnicity is intended that the working group so that the communication of scientific work, students can run well. They can give and accept one with the other. According to (Soewolo, 2005, in Rosyidah, 2005) do not all learn the group said as cooperative learning, because the first cooperative learning requires positive interdependence means that there is a shared responsibility between the group members. Both individual accountability which means that each member of the group must contribute to the group and to learn from the group. Third in the group inter-personal skills means there is no communication between members, they trust each other, dividing the leadership, make decisions together and resolve different opinions together. Furthermore, their fourth face interaction means that each student in the group sued each other face to face so as to have a dialogue with faculty and students. Furthermore, the fifth evaluation means that within the group there must be communication in the form of a reflection of how the team can function properly and could be improved.

CTL approach can foster learning independence. Ability discover new facts needed in independent study.

rejected. Thus there are differences in creative thinking and science process skills of the students who take the classes using the communication of scientific work with students who attend lectures with conventional learning (discussion of information). Summary of test results of multivariate tests with test Pillai's Trace, Wilks' lambda, Hotelling's Trace, Roy's Largest Root shown in Table 4.

Independent learning is a learning activity that is done on impulse itself. As presented by Mudjiman (2009) "A person who is running a self-learning activities more marked, and are determined by the motives that encourage learning. Not by the physical appearance of their learning activities. "So in carrying out learning activities, students are required to study self-reliance, so as to achieve optimal learning results. Besides training students the courage to say what he thinks in communicating scientific performance.

2) Second Hypothesis Test Results

The results of the second hypothesis, which is done using Analyze multivariate analysis of variance (MANOVA) with SPSS 16.00 for windows with an F on Test Of Between-Subjects Effects of 15 676 with a significance level of 0.000 indicates less than 0.05. Based on the test results on the Test Of Effect Between Subjects who showed F count <0.05. then H₀ is rejected, stating that there is no difference between the creative thinking of students who follow the work of communication science students to follow conventional teaching (discussion of information). Thus H_a received stating that there is a difference between multiple creative thinking of students who take the classes using the communication of scientific work with students who take the classes conventionally (discussion of information). These results support the results of the descriptive analysis showed that the students who take the classes using the scientific work of communication has an average value of 72.55 with both categories. For student learning outcomes that use conventional lectures (discussion of information) an average of 57.72. There is a difference between the students who complete communication with the scientific work of students who take the classes conventionally (discussion of information). Summary results of the calculation Test Of Between-Subjects Effects are shown in Table 4.

Table 4: Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Creative Thinking	1914.689 ^a	3	638.230	15.676	.000	.373
	Science Process Skill	668.838 ^b	3	222.946	10.496	.000	.285
Intercept	Creative Thinking	478821.090	1	478821.090	1.176E4	.000	.993
	Science Process Skill	488629.768	1	488629.768	2.300E4	.000	.997
Scientific Work Communication	Creative Thinking	1914.689	3	638.230	15.676	.000	.373
	Science Process Skill	668.838	3	222.946	10.496	.000	.285
Error	Creative Thinking	3216.431	79	40.714			
	Science Process Skill	1678.001	79	21.241			
Total	Creative Thinking	483414.980	83				
	Science Process Skill	490749.437	83				
Corrected Total	Creative Thinking	5131.120	82				
	Science Process Skill	2346.839	82				

Process skills is one of the characteristics of learning science because it is used to solve problems through scientific investigation, therefore, the implementation of the course of scientific work of communication used in this study because of the discovery process concepts are formed and developed through a scientific process that involves investigations or experiments as part of the scientific performance. The results of the scientific work of communication has an average value of 72.55 with both categories.

Along science process skills, necessary also to think creatively to solve problems of students in everyday life. Angreany, (2013) describes creativity is an ability to create something new or new ideas in the face of a problem. Aware of the importance of creativity in solving everyday problems, teachers are expected to devise a method of learning and approaches to develop students' creativity, but before that the teacher must first determine the extent of the creativity of the students by asking students to not only focus on one way of solving but also some way of solving a greater emphasis on the creativity of the students.

The use of scientific work of communication in the lecture courses Morphology of Plants use scientific working communication was in fact related or mutually supportive with thinking skills, especially in completing tasks such as identifying information that is relevant to the topic of student's research, apply knowledge to new problems by using a conclusion to formulate a response and evaluate the performance of investigations of others (Doymus et al, 2009).

3) Results of the Third Hypothesis Testing

The third hypothesis testing with testing the second hypothesis using F value analysis test models of between-subjects effect. According to Table 05, the F value of 10.496 with a significance level of 0.000. There are differences between the science process skills of students who follow the scientific work of communication with students to follow conventional teaching (discussion of information). The statement is evidenced by the results of the descriptive analysis shows that the average score F for the students who take the classes with scientific work asked of 82.12. For students who take the classes conventionally (discussion of information) indicates an average value of 67.36. From the

average value is then seen that there is a difference between the value of science process skills of students who follow the scientific work of students of communication with students to follow conventional teaching (discussion of information).

The formation of the group in the contextual based learning is essential to foster teamwork in building communication. Yuliana et al, (2013) describes a heterogeneous group formation can be complementary advantages and disadvantages of each individual, so that in a group discussion to solve the problem will get maximum results and mastery of each member of the group evenly.

Moreover, the interaction within the group, it can improve the ability to communicate and social learning to appreciate the opinions and ideas of other friends, which in turn can improve affective abilities of students. Correspondingly Lie (2002), said that the cooperation within the group is a very important requirement for survival, without cooperation there will be a no no individual, family, organization or school.

Students who take the classes conventionally (discussion of information) indicates the value is quite low, an average of 67.36. Indrawati, 2003 in (Trianto, 2008). To obtain the results of learning and science process skills that maximum would require an analysis of the causes of learning outcomes and science process skills are low, as for some of the things that cause results low learning is, (1) students are less prepared to absorb the lessons, (2) lack of knowledge teachers about innovative learning, (3) teachers still teach using conventional learning.

Thus to improve the science process skills and creative thinking in biology lectures there needs to be a reflection of lecturers, among others, (1) to design all activities well and completed by students in two to three meetings. This strategy is very useful in developing basic skills; (2) lecturers need to design a practical activity involving students in selecting procedures and data analysis. This strategy is important to develop investigative skills (using literature, aspects of experimental design, and planning). Experimental investigation activities can provide practical experience of scientific inquiry; (3) laboratory activity takes a long time (one semester). Need to be prepared by the

lecturer well then given the opportunity for students to choose freely. Then get coaching by lecturers. It is a strategy that can provide guidance to students in engineering and inquiry in development research activities on a small scale.

5. Conclusion

5.1. Conclusion

Based on the results of research and discussion it can be concluded the following results.

- 1) Terdapat differences in learning outcomes and science process skills among students who follow the teaching of scientific work communication with students who follow conventional teaching (discussion of information).
- 2) There are differences in learning outcomes between groups of students studying the scientific work of communication with students who learn through conventional teaching (discussion of information).
- 3) Terdapat differences creative thinking among students who learn through conventional learners (discussion information)
- 4) Scientific Work communication is better than conventional learning (discussion information) to improve creative thinking and science process skills of students.

5.2. Suggestion

- 1) Lecturers need to provide an understanding of the application of learning with CTL approach, resulting in the implementation of teaching and learning activities, students are able to adapt the approach. So it becomes a reference in the student teaching practice
- 2) Lecturer should implement measures CTL approach correctly before making observations.
- 3) Lecturers should facilitate lectures to familiarize the student by providing biological problems that have many means of solving scientific work that is an indicator of communication so that the creativity of thinking and science process skills of students can be increased in accordance with the purpose KKNi.
- 4) For the student, should be used to practice to find many ways completion in solving biological problems in order to solve the problems in the daily life of students become more creative in thinking by not just focusing on one way of solving but also be able to find alternatives ways settlement other through the communication of scientific work.

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